Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

Claims 1-12 (withdrawn)

Claim 13 (original) A method to determine the preferred fracture orientation for optimized hydraulic fracture treatments in a wellbore, comprising: providing a stress profile system having a contact stress sensor; locating said contact stress sensor; measuring contact stress between a casing and a contact surface disposed about the casing; perforating the casing in a pre-selected geological test zone; performing a hydraulic fracture treatment within the test zone to induce changes in the contact stress; measuring changes induced in the contact stress between the casing and the contact surface; determining formation stress around the wellbore; and determining a preferred hydraulic fracture orientation.

Claim 14 (original) The method of claim 13, wherein the step of determining the formation stress comprises: measuring a fracturing pressure during the step of performing a hydraulic fracture treatment within the test zone; and measuring post fracture contact stress at the test zone after performing a hydraulic fracture treatment within the test zone.

Claim 15 (original) The method of claim 14, further comprising the steps of: re-perforating the subterranean formation according to the preferred orientation of the hydraulic fracture; and performing a hydraulic fracture treatment aligned with the preferred orientation of the hydraulic fracture.

Claim 16 (original) The method of claim 15, wherein the post fracture contact stresses is selected from the group consisting of formation stress, fracture closure stress, minimum formation stress, and in-situ stress.

Claim 17 (original) The method of claim 16, wherein the post fracture stress is the formation stress.

Claim 18 (original) The method of claim 16, wherein the post fracture stress is the fracture closure stress.

Claim 19 (original) The method of claim 16, wherein the post fracture stress is the minimum formation stress.

Claim 20 (original) The method of claim 16, wherein the post fracture stress is the in-situ stress.

Claim 21 (original) The method of claim 16, wherein the step of determining a preferred hydraulic fracture orientation comprises determining the far field stress and a fracture geometry.

Claim 22 (original) The method of claim 21, wherein the step of determining a preferred hydraulic fracture orientation comprises calculating a preferred hydraulic fracture orientation according to the following equations:

$$div\sigma = 0 \qquad \text{on body B}$$

$$\varepsilon = \tfrac{1}{2} \cdot (\nabla u + \nabla u^T)$$

$$\sigma = L[\varepsilon]$$

$$\hat{e}_i \cdot (\sigma \cdot n) = \sigma_i \qquad \text{on } \partial B_{1i}\text{, the surface of B}$$

$$\hat{e}_i \cdot u(\chi_\beta) = u_i(\chi_\beta) \qquad \text{on } \partial B_{1i},\ \beta = 1, N_s$$

Claim 23 (original) The method of claim 22, wherein the step of calculating the formation stress comprises: measuring a fracture formation stress during the step of performing a hydraulic fracture treatment within the test zone; measuring a post fracture formation stress after the step of performing a hydraulic fracture treatment within the test zone.

Claim 24 (original) The method of claim 23, wherein the formation stress comprises the initial formation stress, fracture formation stress and post fracture formation stress.

Claim 25 (original) The method of claim 24, wherein the step of determining a preferred hydraulic fracture orientation comprises calculating far field stress data, a well departure angle and a fracture plane geometry.

Claim 26 (original) The stress profile analyzer of claim 25, wherein the effect of the pressure perturbation on a contact stress may be determined by the data processor.

Claim 27 (original) The stress profile analyzer of claim 26, wherein the contact stress sensor array comprises three or more contact stress sensors disposed about the circumference of the casing.

Claim 28 (original) The stress profile analyzer of claim 27, wherein the contact surface is selected from the group consisting of a cement sheath, formation, gravel pack, concentric casing and combinations thereof.

Claim 29 (original) The stress profile analyzer of claim 28, wherein the contact surface is the cement sheath.

Claim 30 (original) The stress profile analyzer of claim 28, wherein the contact surface is the formation.

Claim 31 (original) The stress profile analyzer of claim 28, wherein the contact surface is the gravel pack.

Claim 32 (original) The stress profile analyzer of claim 28, wherein the contact surface is the concentric casing.

Claim 33 (original) The stress profile analyzer of claim 27, wherein the contact stress sensors comprise fiber optic sensors.

Claim 34 (original) The stress profile analyzer of claim 27, wherein the fiber optic sensors comprise piezo electric sensors.

Claim 35 (original) The stress profile analyzer of claim 27, wherein the fiber optic sensors comprise acoustic sensors.

Claim 36 (original) The stress profile analyzer of claim 27, wherein the fiber optic sensors comprise strain gauge sensors

Claim 37. The method of claim 27, wherein the step of determining a preferred hydraulic fracture orientation comprises calculating a preferred hydraulic fracture orientation according to the following equations:

$$div\sigma = 0 \qquad \text{on body B}$$

$$\varepsilon = \tfrac{1}{2} \cdot (\nabla u + \nabla u^T)$$

$$\sigma = L[\varepsilon]$$

$$e_i \cdot (\sigma \cdot \hat{n}) = \sigma_i \qquad \text{on } \partial B_{1i}\text{, the surface of B}$$

$$\hat{e}_i \cdot u(\chi_\beta) = u_i(\chi_\beta) \qquad \text{on } \partial B_{1i},\ \beta = 1, N_s$$

Claims 38-61 (withdrawn)